JOURNAL
OF THE
ARNOLD ARBORETUM

VOLUME I JANUARY, 1920 NUMBER 3

NOTES ON AMERICAN WILLOWS. VII

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a. THE SPECIES OF THE SECTION ADENOPHYLLAE

THIS section consists of two main types of which one is characterized by the more or less bluish white undersurface of the leaves while the other has the leaves greenish beneath. I do not, however, wish to say that the species with discolor leaves are to be regarded as more closely related to each other than to the species of the other group. It is, at present, very difficult to judge the true relationship of the different forms referred by me to this section. Furthermore, it is by no means easy to separate this group from the section *Cordatae* or from other species of different sections. As to the *Cordatae*, I am not yet well enough acquainted with some of the western forms of this group to be able to draw a sharp line between them and the *Adenophyllae*. I think, however, that the structure of the stigma and the style combined with other peculiarities of the flowers are the best characters by which to separate those two sections. I hope to point out these characters more clearly in the keys which I shall prepare for all the American species.

A very remarkable species is *S. Chamissonis*, which I refer only provisionally to this section. The characters of its flowers are very similar to those of the other species but the habit and the leaves distinguish it at the first glance from them. *Salix adenophylla*, the type of this section, seems to be closely related to *S. commutata* and *S. Eastwoodiae*, but it is a well-marked species. The last two species are rather difficult to separate, and *S. commutata* may be connected with *S. Barclayi* by certain forms which need further study. There are, besides, hybrids between the two species, and I suppose that a better understanding of the variability of both species will enable us to distinguish other varieties or even subspecies. With *S. Barclayi* seems to be very closely connected a form from Alaska named by Coville *S. Walpolei* in the herbarium only, and apparently distributed under this name because it is mentioned by Gärtner (see later under *S. Barclayi*). I have seen the material of this interesting form in the National Herbarium at Washington and I regret that the name has not yet been published. For this reason I am not able to deal with this variety or species. There is another form collected by Miss Eastwood in the Yukon Territory and northern British Columbia which looks to me like a new species and has been provided with a name by the collector. Unfortunately this name has been used before and cannot be used again. Therefore, I think it best not to describe it as a new species as long as I have not had an opportunity to study more copious material. I shall speak of this form under *S. Barclayi.*

S. orestera is in some respects rather intermediate between *S. Eastwoodiae* and *S. Lemmonii* but the relationship of this species seems to lie with *S. Geyeriana* which belongs to another section with which I shall deal later.

In 1909, Ball regarded *S. Wolfii* as closely related to *S. Barclayi* and *S. monticola.* The male flowers of the first have, however, two glands, and I believe it represents a group of its own of which I shall speak later. A very uncertain form is *S. latiuscula* mentioned later under *S. Barclayi.*

As to the name of this section, I wish to say that in 1904 I took *S. adenophylla* for the type of a new section, and I referred *S. Barclayi* to the *Hastatae*, a section I now believe not represented in the New World. In 1909, Ball created the section Commutatae, probably not knowing my older name, therefore the synonymy of the group is as follows: Sect. *Adenophyllae* Schneider, Ill. Handb. Laubholzk. I. 52 (1904). — Sect. *Hastatae* Schneider, l. c. 51, quoad *S. Barclayi.* — Sect. *Commutatae* Ball apud Coulter & Nelson, New Man. Rocky Mts., Bot. 134 (1909), excl. *S. Wolfii.*

It should be mentioned that Fernald believed that his *S. cryptodonta* is closely related to *S. californica* (*S. Eastwoodiae*) but I think that Fernald's species shows a closer relationship with *S. candida* of which I shall speak in another note.

Before I take up the discussion of the different species and varieties I wish to state that I base my investigations on the same collections mentioned in note 3, on p. 1 of this journal, and I beg leave to offer my very best thanks to the gentlemen in charge of all these herbaria, and also to Miss A. Eastwood, San Francisco, Professor J. K. Henry, Vancouver, and Mr. J. C. Nelson, Salem, Ore.

CLAVIS SPECIERUM

Planta prostrata; folia parva, vix ad 3.5: 1.5–2.1 cm. magna, late obovata (fere suborbicularia) ad obovato-oblonga, basi cuneata, apice plus minusve rotundata, margine dense (saltem infima) et acute glanduloso-serrulata, subtus vix vel satis pallidiora; amenta coetanea; filamenta glabra, fructus plus minusve breviter griseo-villosuli, subsessiles . . . . 1. *S. Chamissonis.*

Plantae erectae et aliis signis diversae.

  Folia matura normalia subtus discoloria, glaucescentia vel albescentia; filamenta semper glabra; ovaria pedicellique glabri (si pedicelli sunt pilosi vide *S. monticolam*, si ovaria fructusve sunt sparse villosi vide *S. Barclayi* var. *hebecarpam*).

    Folia novella et saepe matura laxe vel densius (saltem superne) pubescentia, in epidermide pleraque estomatifera; ramuli novelli et saepe annotini laxe vel densius villosi; amenta pleraque coetanea et pedunculis distinctis foliolatis suffulta; bracteae saepissime lanceolatae et satis acutae, atrofuscae, longe sericeae; fructus 6–9 mm. longi, pedicello 1–2 mm. longo excluso; styli 1–2 mm. longi (in formis *S. glaucophylloidis* ramuli sunt plus minusve tomentosi sed folia costa excepta cito glaberrima) . . . . 2. *S. Barclayi.*

Folia etiam novella glaberrima vel citissime glabra; ramuli novelli sparse pilosi vel ab initio glabri; amenta saepe praecocia, sessilia vel subsessilia, vel bracteae plus minusve oblongae et apice obtusiores vel rotundatae.

Amenta sessilia vel subsessilia, etiam fructifera densiflora et vix ad 4.5:1.5 cm. magna; fructus maturi 5–7 (–7.5) mm. longi pedicello vix ultra 1.25 mm. longo excluso; styli circiter 1.5 mm. longi; folia normalia superiora (surculorumque excepta) vix ultra 8:2.6 cm. magna, superne ut videtur semper stomatibus satis numerosis instructa . . . . . 3. *S. monticola.*

Amenta fere semper pedunculo brevi foliolato suffulta, fructifera pleraque satis laxiflora, saepissime ultra 5 cm. longa ad 8:2 vel 12:2.5 cm. magna; fructus maturi 9–10 mm. longi, pedicello 1.5–2.5 (3) mm. longo excluso; styli 0.5 ad 1.25 mm. longi; folia superiora normalia saepissime longiora vel latiora, circiter ad 9:3.8 vel 10:6 cm. magna, epidermide estomatifera. 4. *S. glaucophylloides* et var.

Folia matura normalia subtus concoloria, viridescentia (in *S. orestera* interdum pallidiora sed satis anguste lanceolata, ovaria et filamenta basi pilosa), superne in epidermide stomatibus numerosis instructa.

Ovaria filamentaque glabra.

Folia circumcirca dense vel densissime glanduloso- (saepe fimbriato-) serrulata vel serrata, normalia (superiora basi fere semper) plus minusve cordata; bracteae florum fere semper fuscae; pedicelli saepissime vix ad 1 mm. longi. 5. *S. adenophylla.*

Folia minimis exceptis integerrima vel saltem versus basim plus minusve brevissime glanduloso-denticulata subserratave, basi obtusa ad rotundata, rarius subcordata; bracteae florum satis flavo-brunneae; pedicelli saepissime 1–1.8 mm. longi . . . . 6. *S. commutata.*

Ovaria et filamenta (basi) pilosa.

Folia normalia superiora elliptica, elliptico-lanceolata vel elliptico-oblonga, ad 5.5:1.5 vel (surculorum excepta) 6.5:2.1 cm. magna, plus minusve integerrima vel distanter et saepe obscure glanduloso-denticulata, sed inferiora minora satis dense glanduloso-denticulata: fructus maturi 6–6.5 (rarius ultra) longi, pedicello vix ultra 0.5–1 mm. longo excluso; styli 1–1.5 mm. longi . . . . 7. *S. Eastwoodiae.*

Folia normalia superiora anguste lanceolata ad late oblanceolata, 4:0.8 ad 7.5:2 cm. (surculorum excepta) magna, integerrima vel distanter et sparse glanduloso-denticulata subserratave, etiam minora satis obscure glanduloso-denticulata, adulta subtus glabrescentia subpallidiora vel paullo glaucescentia; fructus maturi 7–8.5 mm. longi pedicello ad 1.5 mm. longo excluso; styli 0.8–1.2 mm. longi . . . . 8. *S. orestera.*

ENUMERATIO SPECIERUM

1. **S. Chamissonis** Andersson. — See Bot. Gaz. LXVII. 63 (1919). As I have mentioned in a foot-note, I did not know this species well enough when I wrote my third note and referred it to a group of "species sectionis incertae." After having seen good male material I think it best to put it in this section, but *S. Chamissonis* is easily distinguished from all the other species by its creeping habit and the fine and close serration of the leaves, the teeth being acute and not distinctly glandular as in *S. adenophylla. Salix Chamissonis* may prove to be more closely related to certain willows of northern Asia with which I am not yet well enough acquainted. I have seen the following specimens of this very rare species.

ALASKA. Port Clarence, July 12, 1899, *Trelease & Saunders* (No. 3427, fr. im.;

M.); same place and date, *Coville & Kearney* (Nos. 1877, 1878, fr., cuminat., 1879 m.; A., W.), same place, *L. J. Cole* (fr.; W.); St. Lawrence Isl., July 13, 1899, *B. E. Fernow* (m.; Cor.); Cape Nome, summer 1900, *F. E. Blaisdell* (m., f.; W.); Lake Iliama region, on tundra, Nogheling trail, not abundant, August 5, 1902, *M. W. Gorman* (st.; W.).

2. **S. Barclayi** Andersson in Öfv. Svensk. Vetensk. Akad. Förh. XV. 125 (1858). — Macoun, Cat. Canad. Pl. II. 445 (1883); in Svensk. Vetensk. Akad. Handl. VI. 164, t. 8, fig. 96 [incerta] (1867); in De Candolle, Prodr. XVI.² 254 (1868), excl. var. *latiuscula*. — Howell, Fl. N.W. Am. I. 620 (1902). — Coville in Proc. Wash. Acad. Sci. III. 316 t. 36 (1901). — Piper in Contrib. U.S. Nat. Herb. XI. 215 (Fl. Wash.) (1906). — Jones, Will. Fam. 16 (1908), pro parte. — Ball apud Coulter & Nelson, New Man. Rocky Mts. Bot. 134 (1909); apud Piper & Beattie, Fl. N.W. Coast, 116 (1915). — Henry, Fl. S. Brit. Col. 100 (1915). — Rydberg, Fl. Rocky Mts. 193 (1917). — *S. Barclayi* a) *rotundifolia* Andersson in Svensk. Vetensk. Akad. Handl. VI. 164 (Monog. Salic.) (1867); in De Candolle, Prodr. XVI.² 254 (1868). — *S. Barclayi* b) *grandifolia* Andersson, l. c. 165 (1867); l. c. 254 (1868).

I have before me a photograph of the type of this species and some fragments from the Kew Herbarium. Andersson's description is correct except the statement "capsulis glabris," the old ovaries being hairy at the top and on the pedicel. Peculiar are the rather long and thin stigmas and the styles which measure up to 2 mm. This may partly be due to the fact that the flowers are old. With the exception of the uppermost the bracts are covered with long straight silky hairs, but at the top of the ament there is a pubescence of curled hairs. The gland is relatively narrow, and as long as the pedicel. The leaves of the type are only half developed and are blackened in drying. I have not been able to recognize stomata in the upper surface.

The type ranges, as Coville already has said, in Alaska throughout the southern coast region "from Dixon entrance northward and westward as far as Unalaska." The original specimens were collected in 1839 at a point near Cape Greville on Kadiak Island, Alaska, by George Barclay, the botanical collector of the British ship "Sulphur." From British Columbia I have seen material from Lake Atlin in the northwest, from Yellow Head Pass in Cariboo County, and many specimens from New Westminster and Kootenay Counties. In Alberta the species occurs in Edson (Jasper Park) and Rocky Mountain Districts. In the United States typical *S. Barclayi* is found in Washington (Clallam, Chelan, Okanogan, Kittitas, Pierce and Skamania Counties), and in Montana (Teton and Cascade Counties, and in the vicinity of "Trail Lake," a locality I have not been able to identify; also E. C. Shear's no. 209 from the Electric Peak in the northern Yellowstone Park seems at least in part to belong to this species, as probably does also no. 110 of the same collector [fr. im.; W.]). Specimens like A. Nelson's nos. 7781 and 8947 from the Albany County in Wyoming need further observation and may be more closely related to *S. monticola*. In 1867, Andersson described 3 varieties, *rotundifolia*, *grandifolia* and *angustifolia* The first is nothing but the type which is cited under *rotundifolia* by the author himself in 1868. The second variety had originally been described without a type specimen, but in 1868 Andersson cites "Unalascha [*sic*] (Eschscholz)." It seems to me that this form too cannot be distinguished from the type. The third variety is according to the author's quotation in 1868 founded on specimens collected "in Sitcha et Unalaschka (Herb. Petrop.)" which are unknown to me. So far as I can judge by the description "folia paullum breviora, ¼ poll. lata, exacte lanceolata, tenuia, glabriuscula, integra, subconcoloria facile nigrescentia, stipulis fere nullis ornata," this form may be identical with what has been described by Bebb as *S. conjuncta*. The type was collected by Parry on Mt. Adams in Washington, and I have seen it and the other co-types cited by Bebb in his herbarium at the Field Museum. Bebb himself said later (apud Coville in Contr. U.S. Nat. Herb. IV. 198 (Bot. Death Val. Exp.) (1893)) that his *S. conjuncta* "does not differ from the Alaskan type" of *S. Barclayi*, and it is indeed very difficult to distinguish Bebb's type from typical *Barclayi*. As to its identity with var. *angustifolia* I cannot decide without having seen the specimens of the Herb. Petrop. Even the typical *S. conjuncta* is at present rather uncertain because I have not yet seen mature leaves which undoubtedly belong to the form which Bebb cites as his type. In 1914, Ball in the Herbarium of the Geological Survey of Canada has made *S. conjuncta* a variety of *S. Barclayi*, and there are the following specimens which may be referable to such a variety sensu Ball. All of them need further observation.

WASHINGTON. Skamania County: Mt. Paddo (Adams), August, 1880, *C. C. Parry* (No. 7, m., f.; C., type, G. co-type of *S. conjuncta* Bebb); same mountain, 1883, *L. F. Henderson* (No. 79, m., f.; C., G.); same Mt., on a meadow, 2000 m., July 13, 1886, *W. N. Suksdorf* (No. 9263, f.; A.); Little Klickitat River, north trail to Mt. Adams, wet meadows, August 4, 1892, *L. F. Henderson* (fr.; Pu.).

OREGON. Wallowa County: Higher Wallowa Mts., near the Lake, August 2, 1899, *W. C. Cusick* (No. 2302, m., f.; C., G., M.; "a low shrub"; of the male specimen in Cor. the filaments are partly united).

MONTANA. Gallatin County: Bold Mt., 2300–2600 m., July 21, 1880, *S. Watson* (No. 372 ^{a}, f.; G.; one of the co-types of *S. conjuncta*, a rather uncertain form).

BRITISH COLUMBIA. Kootenay District: Revelstoke, marshy woods, May 6, 1890, *J. Macoun* (No. 9 [= 24266, 0.], m., f.; named by Ball in 1914 *S. Barclayi conjuncta*, but without old leaves difficult to identify properly); same locality, date and coll. (No. 2, m., f.; A.; bracteis plus minusve subcrispato-sericeis, ceterum ut praecedens, foliis superne stomatiferis). New Westminster District: Chilliwack Valley, about 1850 m., July 29, 1901, *J. M. Macoun* (No. 26907, O.; f.; G.; same state as No. 24266, pedicellis pilosis, foliis superne stomatibus numerosis instructis).

S. conjuncta Rydberg, Fl. Rocky Mts. 194 (1917) seems to me an uncertain form.

The type of *S. Barclayi* **hebecarpa* Andersson in Svensk. Vetensk. Akad. Handl. VI. 165 (Monog. Salic.) (1867) was collected by Kastalski in Unalaschka, and the author said: "Cum *S. Barclayi* nuperrime descripta omnibus partibus exacte congruit sed differt capsularum indumento opaco." As I have already stated, even the ovaries of Andersson's type of *S. Barclayi* show evidence of a pubescence, and there are probably to be found such forms with a more or less hairy ovary everywhere in the region of the typical form. I refer to var. *hebecarpa* specimens collected by A. Rehder and also by J. G. Jack in British Columbia at Asulkan Valley on August 14, 1904 (m., f.; A.). Some of them resemble *S. commutata* f. *puberula* (see later) but the stigmas are much more like those of *S. Barclayi*.

Still absolutely uncertain is the form described by Andersson, l. c. as *S. Barclayi* * *S. latiuscula*, and later in De Candolle, Prodr. XVI.[2] 255 (1868) as *S. Barclayi* B) *latiuscula*. Andersson said "specimen singulum in herb. Candolleano vidi e Terra Nova a De la Pylaie missum." Fernald (in Rhodora XVI. 173, 1914) states that "the Newfoundland *S. latiuscula* Andersson, which has also been confused with *S. Barclayi* has densely sericeous-tomentose capsules and remarkable long reflexed stigmas, much longer than any other species known to the writer, and its foliage is not conspicuously glaucous beneath." Fernald did not see the type, and he regards as *S. latiuscula* a specimen of Waghorne's from Newfoundland, Bay of Islands, McIver's Cove, May 31, 1898 (No. 38, f. adult.; G.) which I have seen. The aments are subsessile with two or three small leaves at the base, which are covered beneath with rather long and partly reddish brown hairs; the peduncle also bears towards the base a somewhat reddish tomentum. Without the peduncle the aments measure about 4:1.5 cm. The ovaries are thinly pubescent and the stigmas are as stated by Fernald very long and revolute. I am not sure if this condition is normal. The young leaves much resemble those of *S. discolor* Muhl.; the largest one is oboval-lanceolate, 2.7 cm. long and 1.1 cm. wide with a distant glandular dentation. The upper surface is sparsely covered with grayish and fulvous hairs, while the lower surface is entirely glabrous with the exception of a few hairs along the midrib. The first small leaves show a denser glandular dentation and below a pubescence of longer hairs. The one year old branchlets are glabrous, dark fuscous, while the youngest bear a few hairs. I am by no means convinced that Waghorne's specimen can be regarded as identical with Andersson's var. *latiuscula*. He says (1867) " nectarium valde tenue et elongatum " and (1868) " nectarium valde tenue," a character not found in the flowers of Waghorne's plant. As to the stigmas there is no mention in either of Andersson's rather long descriptions, and in 1868 he said " *S. Barclayi* huic simillima sed recedit capsulis omnino glabris." After all the type of Andersson's form as well as Waghorne's specimen seem to represent different forms, and I hope that I may be able to examine the type in Herb. De Candolle in order to explain the identity of this interesting form.

As I have already mentioned on p. 147 there is another Alaskan form which bears a close resemblance to *S. Barclayi*. This form has been named *S. Walpolei* by Coville (and Ball) in the National Herbarium. This name has not yet been published, and I would not mention it if I had not found it in Gärtner's dissertation: Vergl. Blattanatomie Syst. Gatt. Salix, 44 (Goettingen, 1907). This author cites a specimen from the Museum at

Berlin, and therefore this Willow must have been distributed under the name *S. Walpolei* long ago. I am sorry that neither Coville nor Ball published this name, and in spite of several requests I have not obtained permission to deal with this form in my present note. I can only say that I have seen the material preserved in the National Herbarium, and that it seems to me that this form is very closely related to *S. Barclayi* and may represent nothing but a variety of it, which occurs farther north than the type on Seward Peninsula.

Still another form closely related to *S. Barclayi* has been collected by Miss A. Eastwood in the Yukon Territory and near Lake Atlin in northern British Columbia. In a field note the collector says of it: " This is related to *S. Barclayi* but differs in the catkins being borne on the old wood. It seems to be confined to the Yukon. It is a very beautiful shrub with its young leaves red, and broad smooth leaves. There was only one bush in Dawson that bore flowers and that was female. I did not discover it while in flower as the bush resembled *S. arbusculoides* and the flowers came out before the leaves." This form looks indeed like a distinct species, but the name *prunifolia* provisionally chosen by Miss Eastwood cannot be used because this name was applied long ago by Smith, Seringe, Host and others to different plants. I do not wish to propose a new name at present, since I think it best to wait for more material and a better understanding of this peculiar plant. It may, however, be said, that it seems to differ from *S. Barclayi* chiefly in the following characters: ramulis ab initio glabris, foliis novellis rubescentibus, tantum superne pilis villosis deciduis praeditis, adultis tenuioribus magis crenato-serratis, amentis ut in *S. monticola* praecocibus, sessilibus subsessilibusve, bracteis obtusioribus, antheris ut videtur violaceis, fructibus minoribus (? tantum 5–6 mm. longis). I am not sure of the constancy of these characters, the fruits of the Atlin specimens are partly up to 8 mm. in length and hardly distinguishable from those of typical *S. Barclayi*. In its glabrousness and in the sessile aments this new form points toward *S. monticola* (see later) the leaves of which usually seem to possess numerous stomata in their upper surface while I have not observed any in the upper epidermis of the leaves of the Yukon plant. The following specimens have been examined.

Yukon Territory. Dawson, near corner of big fence, June 9, 1914, *A. Eastwood* (No. 173, f.; A.; this number should be regarded as the type); July 4, 1914, same coll. (No. 508, st., same plant according to the collector), June 14, 1914, same coll. (No. 230, f.; A.; young leaves purplish); June 9, 1914, same coll. (No. 166, st.; "small bush near my cabin," like 230); Ogilvie, July 8, 1914, same coll. (No. 541, fr.; A.; amentis ad 6 cm. longis, partim pedunculatis, fructibus ad 8 mm. longis; this resembles *S. Barclayi*, but is entirely glabrous, the leaves are large, ovate-elliptical and measure up to 8:3.1 cm.); Coffee Creek, July 10, 1914, same coll. (No. 552 a. m., 553, m., A.); Hardcreek Slough, July 11, 1914, same coll. (No. 581, fr., A.; amentis 4.5:1.3 cm. magnis, fructibus tantum 5 mm. longis pedicello 1.8 mm. longo excluso); Yukon River above Rink Rapids, river flat, July 9, 1902, *J. Macoun* (No. 54405 a, O., st.).

British Columbia. Lake Atlin, July 14, 1914, *A. Eastwood* (No. 635, fr.; A.; fructibus maturis circ. 6 mm. longis, basi ovoideis, forma *S. monticolae* satis similis);

same place, date and coll. (No. 653 fr.; A.; No. 661, fr. adult.; A.; ramulis pilosis, probabiliter ad *S. Barclayi* referenda).

3. **S. monticola** Bebb apud Coulter, Man. Rocky Mts. Bot. 336 (1885). — Ball apud Coulter & Nelson, New Man. Rocky Mts. Bot. 134 (1909). — Wooton in Bull. New Mex. Coll. Agric. LXXXVII. 46 (1913). — Rydberg, Fl. Rocky Mts. 194 (1917), prob. tantum ex parte. — *S. padifolia* Rydberg in Bull. Torr. Bot. Club, XXVIII. 272 (1901), non Andersson. — *S. padophylla* Rydberg, l. c. 499 (1901), Fl. Rocky Mts. 194 (1917).

Of these species I have seen the type mentioned below and the different co-types in Bebb's herbarium. Ball was the first to recognize its wide distribution. I have tried to give its main characters in the key, but I think that *S. monticola* is one of those species which need careful observation in the field. Many specimens in the herbarium are easy to recognize, while quite a number of them cannot be identified properly on account of the lack of mature leaves or of flowering branchlets. Sterile specimens often are similar to forms of other groups especially those of sect. *Cordatae*. In its normal state the leaves are not large while on offshoots they reach a great size, and therefore may appear different. I believe that the following specimens can be taken for typical *S. monticola* but some of them need further observation. The enumeration of the specimens clearly shows the geographical distribution of the species, which probably occurs in other localities in the Rocky Mountains where the centre of its distribution seems to be Colorado. Its northern limits are still uncertain, and I have seen specimens of the northern Rockies as far as Alberta (Banff, Cave Avenue, July 4, 1891, *J. Macoun* [Nos. 40 and 41, fr., st.; C.]), which I am not able to determine properly at present.

MONTANA, Madison County: 10 mi. east of Monida, along a creek, June 18, 1899, *A. & E. Nelson* (No. 5427, f.; Cor., S., M., N.; 5446; f.; Cor., G.; the last one has rather long pilose pedicels and may belong to a species of Sect. *Cordatae*). Flathead County: Columbia Falls, June 5, 1893; *R. S. Williams* (No. 970, m., f.; Cor.); Summit, G. N. Ry., July 25, 1894, same coll. (m., fr.; Cor.). Gallatin County: Bozeman, April 26, 1900, *Blankinship* (f.; Cor.).

SOUTHERN WYOMING. Carbon County: Battle, Continental Divide, 3000 to 3500 m., July 17, 1891; *F. Tweedy* (No. 4534, fr.; N., W.). Albany County: Medicine Bow Mts., Nash's Fork, common, July 28, 1900, *A. Nelson* (No. 7781, fr.; Cor.; "in clumps, 1.2 to 2.4 m. high"); Sand Creek, moist ground, very common, May 30, 1900, same coll. (No. 6964, fr., m.; C., Cor., G., H., W.). Centennial, 2700 m., August 19, 1918, *J. G. Jack* (No. 1062, st.; A.; "bushes 3 to 3.6 m. high, bright yellow green branches"; forma porro observanda).

NORTHERN WYOMING. Eastern slopes of the Big Horn Mts., headwaters of Clear Creek and Crazy Women River, about 2300 to 3000 m., July 20 to August 15, 1900, *F. Tweedy* (No. 3428, st.; N.; forma incerta parvifolia).

COLORADO. Larimer County: Estes Park, June 10, 1916, *E. L. Johnston* (No. 860, f.; G., W.); same place, Thompson's River bank, August 11, 1910, same coll. (No. 766, st.; N.; forma mihi quamvis incerta); Chamber's Lake, about 3150 m., July 13, 1896, *C. F. Baker* ([Rowlee 3], fr.; N.); Sheep Creek, above Campton's, August 4, 1896, same coll. ([Rowlee 1] st.; N.). Grand County: east of Middle Park, Beaver Dam, 1861, *C. C. Parry* (No. 342, m., f.; G.); on Grand River near Hot Sulphur Spring, August 1, 1881, *G. Engelmann* (No. 5, st.; C., G.; "bark yellow, stem 1–1½ inch thick, 6–8 feet high, densely cespitose bushes"); Middle Park, August, 1892, *H. C. Beardslee* (fr.; M.); Forest City, about 3300 m., June 25, 1880, *G. Engelmann & C. S. Sargent* (f.; A.). Clear Creek County: Georgetown, *Wolf & Rothrock* (No. 826, f.; G.; the male piece is *S. Bebbiana*); same place, August 17, 1895, *P. A. Rydberg* (fr.; N.); mountain sides near Georgetown, about 2800 m., July 15, 1885, *H. N. Patterson* (fr.; st.; C.; syntype [sheet 7589]; "0.9 m. high"); Clear Creek bottoms, June 28–August 7, 1875, same coll. (fr.; C. [sheet 7588]); without locality and date, *Brandegee* (fr.; C. [sheet 6432]); marshy places in Bard Creek Valley, opposite Empire City, August 11, 1881, *G. Engelmann* (fr.; C.; G.; "2.4–3.6 m. high, cespitose, 2.5–5 cm. diam."); Empire City, on Bard Creek, August 3, 1874, *G. Engelmann* (st.; M.). Lake County: Leadville, bank of streams, 3400 m., June 20, 1916, *J. W. Clockey* (No. 2668 m., f.; C., G.); same place, June 19, 1918, *A. Eastwood* (Nos. 7112, m., 7143, 7144, f., 7154, m.; A.). Denver County: Denver, July 13–15, 1872, *T. C. Porter* (fr.; C.). Jefferson County: mountains near Golden City, March 30, August 1, 18 . . ?, *Greene* (No. 8, fr. im., st.; type in C. [sheet 1147]); same place, March 25, May 30, August 1, same coll. (No. 7, f., fr., st.; C., [sheet 1148]). Chaffee County: near Granite, September 13, 1898, *J. G. Jack* (st.; A.; forma quamvis incerta); Buena Vista, June 18, 1818, *A. Eastwood* (No. 7071, fr. adult.; A.; forma incerta). Montrose County: Tabeguache Basin, near creek, about 2700 m., June 4, 1914, *E. Payson* (Nos. 386, m., 388, f.; C., G.; sub nomine *S. chlorophylla* distributa); without exact locality, high alpine summits, 3600 to 4000 m., July 11 to August 11, 1876, *H. N. Patterson* (st.; C.). Ouray County: near Ouray, along Uncompahgre River, 2330 m., September 10, 1901, *L. M. Underwood & A. D. Selby* (No. 248, st.; N.). Gunnison County: Gunnison, about 3350 m., August 27, 1901, *C. F. Baker* (No. 941, st.; N.; "an occasional large bush in bottoms, only sterile seen"; forma porro observanda foliis ovato-ellipticis, basi leviter cordatis, subtus tenuiter reticulatis glabris stipulis reniformibus vel obtusis); Elk Mts. Mt. Baldy, July 9, 1906, *J. P. Anderson* (g., M.; mixed with ? *S. Wolfii*); Mt. Carbon, 2750 m., June 11, 1910, *W. W. Eggleston* (No. 5671, fr., W.); vicinity of Mt. Carbon, common, June 1, 1910, *I. Tidestrom* (No. 3458, fr.; W.; "shrub 2 m. or higher"); same Mt., 2700 m., forms dense colonies along the creek, same coll. (No. 3898, st.; A., W.). San Juan County: Silverton, about 3500 m., July, 1895, *F. Tweedy* (Nos. 268, 269, f.; W.). Hinsdale County: Carson, about 3600 m., July 2, 1901, *C. F. Baker* (No. 306, f.; G., N., W.). Huerfano County: on Turkey Creek and tributaries, 2800 to 2900 m., June 8–9, 1900, *Rydberg & Vreeland* (No. 6389, fr., type of *S. padophylla;* N.); Ojo, 2400–2500 m., May 26, 1900, same coll. (Nos. 3686 m., 3687 f., N.). Conejos County: Los Pinos, about 2300 m., May, 1899, *C. F. Baker* (No. 271, m., f., A., C., Cor., N., S., W.). Costilla County: Veta Pass, Sangre de Christo Range, 3000–3600 m., June 9–16, 1890, *G. H. Hicks* (No. 15, m., 17, f.; G.); headwaters of Sangre de Christo Creek, 2700 m., June 22, 1900, *Rydberg & Vreeland* (No. 6378, fr.; N.). ? County: W. La Plata Mts., Bob Creek, common in west places, about 330 m., June 28, 1898, *Baker, Earle & Tracy* (No. 175, f. adult.; A., C., Cor. G., W.; "bush 1.8 to 3 m. high; twigs yellowish"; in the herbarium the branchlets are dark brown; in N. the pedicel is partly pilose); Rocky Mts., without exact locality, 1862, *Hall & Harbour* (No. 4, fr., im.; C.; No. 175, m., f., fr.; G.; pedicellis fructuum pilosis).

UTAH. Summit (or Duchesne) County: Uinta Mts., 1902, *H. D. Langille* (No. 104, f.; W.; mixed with *S. lutea* Nuttall).

NEW MEXICO. Santa Fé County: Santa Fé Cañon, 9 miles east of Santa Fé, about 2600 m., June 2, 1897, *A. A. & E. Heller* (No. 3636, fr. im.; A., Cor., W., N.; pedicelli partim paullo pilosi). Valencia County: Atarque, July 26, 1904, *E. O. Wooton* (No. 2719, st.; W.; det. Ball).

ARIZONA. Black Mesa Forest Reserve: McClintock Canyon, June 2, 1900, *F. V. Coville* (No. 1057, st.; W.). Apache County: south of Thomas Peak, July 2, 1904, same coll. (No. 2009, f.; W.). ? County: Leonard Canyon, June 2, 1900, same coll. (No. 1066, m., W.). Navajo Reservation, arroyos, common, July, 1916, *C. F. Vorhies* (No. 64, st.; A., M.; forma incerta).

A specimen from South Dakota, Black Hills, South Rapid Creek, sandstone, about 2050 m., September 16, 1910, *J. Murdoch, jr.* (No. 4374, st.; C.), is, according to Ball, closely related to *S. monticola*, but I am not sure of its true relationship.

There are several more specimens before me from New Mexico, Colorado and Wyoming the pedicels of which and in part also the ovaries are more or less hairy. I am unable to understand them at present. There may be hybrids among them, but the variation of *S. monticola* is far from being sufficiently known.

4. **S. glaucophylloides** Fernald in Rhodora XVI. 173 (1914). — *S. glaucophylla* Robinson & Fernald, Gray's Man. 323, fig. 652 (1908). non Bebb, sensu str. — Britton & Brown, Ill. Fl. ed. 2, 596, fig. 1462 (1913). — This species is, in my opinion so closely related to *S. glaucophylla* Bebb that I think it best to regard it only as a variety of that Willow. Unfortunately the name *glaucophylla* cannot stand because it was used long ago by Schleicher, Besser and Andersson for some very different plants. Therefore I am obliged to take up Fernald's name, and to make Bebb's *glaucophylla* a variety of it, as I shall explain later. When Fernald proposed his new species he stated that *S. glaucophylla* differed from it mainly in the following characters. 1. " Foliage . . . very much heavier or thicker," but in the description of *S. glaucophylloides* Fernald says that the mature leaves are subcoriaceous. Judging from the copious material before me I do not think that the texture of the leaves is a good character by which to distinguish the two species, because there is hardly a difference between the mature leaves. 2. " The fruiting aments are much longer " in *S. glaucophylla*, but among the specimens which Fernald and I have been able to compare there seem to be no well matured fruiting aments of *S. glaucophylloides*. All of them gave the impression that the fruits were not sufficiently fertilized. Therefore the capsules too, as Fernald said, are smaller in *S. glaucophylloides* and sometimes almost cordate at their base which, however, as a rule is rounded. Those fruits are, in my opinion, not well ripened, and good seeds are wanting. 3. " The pubescence of the peduncle and rhachis longer and denser " in *S. glaucophylla*. This character too is by no means of real taxonomic value, and I have seen specimens of both forms which in this respect were entirely alike. This is the case too as to the pubescence of the bracts of the flowers, which according to Fernald are more copiously long-villose in *S. glaucophylla*. The best character to separate it from the eastern form is found in the length of the pedicels which, as Fernald states, are " distinctly exceeding the scales and many times longer than the nectaries." According to my observations the pedicel even of the best matured fruits (Jack, Montmorency Falls) does not exceed 1.5 mm. in length, while it measures from 2 to 2.5 (–3) mm. in *glaucophylla*. The styles, too, are a little longer in the western form. Taken all in all, however, the eastern form can hardly be regarded as a distinct species, although not a few of the specimens referred to it need further observation. As Fernald said, *S. glaucophylloides*

sensu stricto is " a very common riparian species in the calcareous districts from Aroostook County, Maine, and adjacent Quebec to Newfoundland." Omitting the specimens already mentioned by Fernald I can enumerate the following.

QUEBEC. Anticosti Island: Salt Lake, wet places August 11, 1883, *J. Macoun* (st., No. 24564, O.; forma incerta). Quebec District: Montmorency Falls, June 1, 1903, *J. G. Jack* (fr.; A.; this form is very much like the typical *glaucophylla*, the branchlets are partly glabrous, partly pubescent, in the male plant the leaves are more or less obovate); same locality, June 30, 1905, *J. Macoun* (No. 68792, O., st.; ramulis etiam annotinis pilosis). Champlain County: St. Maurice River near junction of Matawin River, September 4, 1896, *J. G. Jack* (st., A.). Lake St. John District: Roberval, shore of Lake St. John, August 22–23, 1895, same coll. (st.; A.; foliis cordatis, ramulis tomentosis, forma perro observanda).

Geographically these last specimens seem to connect the eastern with the western form. For the one which is first described by Bebb as *S. cordata* var. *glaucophylla* I wish to propose this new combination.

4b. **S. glaucophylloides** var. **glaucophylla** Schneider. — *S. cordata* var. *glaucophylla* Bebb apud Babcock in The Lens, II. 249 (Fl. Chicago Vic. Suppl.) (1873); apud Patterson, Cat. Pl. Ill. 39 (1876). — *S. Barclayi* var. *grandifolia* Bebb in Bot. Gaz. III. 21 (1878), in textu, non Andersson. — *S. glaucophylla* Bebb apud Wheeler & Smith, Cat. Phaen. Vasc. Crypt. Pl. Mich. 72 (1881), non Schleicher (1807), nomen nudum, nec Besser (1822) nec Andersson (1851); in Rep. Nat. Hist. Northwest Univ. (1889) 23, apud Watson & Coulter, Gray Man. ed. 6, 485 (1890).— Glatfelter in Rep. Miss. Bot. Gard. v. 57, t. 3, fig. 18 (Stud. Ven. Salix, 12) (1893). — Griggs in Proc. Ohio Acad. Sci. IV. 311, t. 15 (1905). — *S. cordata* [subsp.] *S. Babcockii* Gandoger, Fl. Eur. XXI. 166 (1890). — After having described this form as a variety of *S. cordata* Bebb in 1878 believed that it was identical with *S. Barclayi*, and especially with Andersson's var. *grandifolia*. Later, in 1881, Bebb, however, made its first variety a distinct species, unfortunately choosing for it the already used name *glaucophylla*. Gandoger proposed the name *S. Babcockii* for apparently the very same form but his name can only be regarded as of subspecific rank, otherwise I should have adopted it for our species. Gandoger's description, too, is very short and therefore I think it best to use Fernald's name *glaucophylloides* for the species. As I have already shown that the main difference between Bebb's type and Fernald's eastern form consists in the somewhat longer styles and pedicels of var. *glaucophylla*, which also has larger fruiting aments and fruits than *S. glaucophylloides* sensu stricto but this seems to be mainly due to the fact that the specimens which Fernald had before him did not have sufficiently matured fruits. Those collected by Jack and enumerated above approach var. *glaucophylla*, of which I have seen material from northern Ohio (Erie County), northern Indiana (Porter County), Illinois (Cook, Lake and Winnebago Counties), the type is Bebb's No. 4, Herb. Salic., from Fountaindale, Wisconsin (Sauck and Manitiwoc Counties), Michigan (Berrien and Huron Counties) and Ontario (Lambton District).

In 1881 Bebb proposed three varieties. The first var. *latifolia* is nothing but the type. The second, var. *angustifolia*, is according to the type in Bebb's herbarium in the Field Museum at Chicago, collected by H. H. Babcock, Chicago (No. 14, f.; [sheet 6996, C.]) and the male co-type of the same collector (No. $2\frac{1}{2}$, [sheet 6994, C.] distinguished from the typical *glaucophylla* by foliis anguste lanceolatis, lanceolatis vel elliptico-lanceolatis, inferioribus 2.5:0.5 ad 4.5:1.2, superioribus 6.5:1.7 ad 9:2.3, in surculis ad 12.5:2.8 cm. magnis, basi acutis ad obtusis, apice subito breviter acuminatis. It can hardly be regarded as more than a form but it ought to be mentioned that the male flowers which I examined did show a dorsal gland which I have not seen in specimens of the typical form. Bebb's third variety, *S. glaucophylla* var. *brevifolia*, looks at first sight rather different. The type was collected by C. F. Wheeler, July 30, 1879, on the sand dunes of Little Traverse Bay, Michigan, and is preserved in the herbarium of the Field Museum [sheet No. 3459]). A typo praecipue differt foliis minoribus magis obovatis 1:0.5 ad 3.5:5:0.8 cm. magnis, basi sensim cuneatis, apice subito breviter acutis, utrinque satis nervatis, subtus reticulatis. This specimen seems to represent an ecological form, and further observations must prove whether it can be regarded as more than a form of var. *glaucophylla*, probably connected by intermediate forms with f. *angustifolia*.

5. **S. adenophylla** Hooker, Fl. Bor.-Am. II. 146 (1839). — Andersson in Öfv. Svensk. Vetensk. Akad. Förh. XV. 125 (1858); in Proc. Am. Acad. Sci. IV. 64 (Salic. Bor.-Am. 20) (1858); in Walpers, Ann. Bot. V. 750 (1858); in Svensk. Vetensk. Akad. Handl. VI. 164, t. 8., fig. 95 [mala] (Monog. Salic.) (1867), in De Candolle, Prodr. XVI.^{2} 254 (1868). — Bebb apud Babcock in The Lens II. 249 (Fl. Chic. Suppl.) (1873); apud Wheeler & Smith, Cat. Pl. Mich. 73 (1881); apud Watson & Coulter, Gray Man. ed 6, 485 (1890). — Britton & Brown, Ill. Fl. I. 504, fig. 1203 (1896); ed. 2, I. 597, fig. 1464 (1913). — Britton, Man. ed. 2,319 (1905). — Griggs in Proc. Ohio State Acad. Sci. IV. 309, t. 14 (Will. Ohio) (1905). — *S. syrticola* Fernald in Rhodora IX. 225 (1907). — Robinson & Fernald, Gray's New Man. 324, fig. 654 (1909).

Hooker gave an excellent description of this well marked species. Andersson only knew the type which had been collected in Labrador (at an uncertain place, probably in the south) by Morrisson. Bebb, in 1873 and 1890, referred to it specimens from the Great Lakes. Fernald, however, in 1907, stated that a careful study of Hooker's original description of *S. adenophylla* and of Andersson's fuller description of the type material shows that the shrub of the Great Lakes can have no close connection with *S. adenophylla*. He, therefore, proposed his new *S. syrticola*. Unfortunately, Fernald, did not see Hooker's type of which I have before me an excellent photograph and some fragments from the Kew Herbarium. Hooker placed his species next to *S. speciosa* and *S. Barrattiana*, and not in the *Cordatae* group to which according to Fernald his *S. syrticola* belongs. Barratt's section *Cinereae* to which Hooker referred *S. adenophylla*, comprises, however, a number of very different species (as for instance besides the two mentioned also *S. candida*, *S. glauca*, *S. Scouleriana* and *S. rostrata* [*S. Bebbiana*]), and this fact proves that neither Barratt nor Hooker made an attempt to separate these forms according to their true relationship. *Salix adenophylla* does not, in my opinion, belong to the *Cordatae*, but its closest connection is with *S. commutata* and *S. Eastwoodiae*. Fernald lays too much stress upon Hooker's characterization of the serrature of the leaves: he says: " This remarkable character of the foliage is sufficient, even if the habitat, Labrador, were not almost convincing, to show that Hooker's plant could not have been the same as the common sand dune shrub of the Great Lakes." I see, however, no reason why Hooker's description should not apply exactly to *S. syrticola*, which also undoubtedly is characterized by " foliis ovatis basi cordatis acutis . . . argute serratis serraturise elongatis glanduliferis . . . stipulis ovato-cordatis grosse glanduloso-serratis." Fernald emphasizes the fact that *S. syrticola* has larger leaves of which even the smallest are 3 cm. long while Hooker's type according to Andersson has only " folia majora ad pollicem longa." But Hooker himself states that the " leaves are an inch or more long." In fact, on the type they measure up to 1 inch and a half in length, and they were probably not fully grown. On the other hand I have seen several forms of *S. syrticola* which in no way could be distinguished from Hooker's type. The fruiting aments of this type are (without the peduncle) only 3.5 cm. long, but apparently not very well developed. The bracts of the old fruits of the fragments which I have seen are partly rather densely pubescent and not only " pilis raris adspersae " or " glabriusculae " as Andersson says. His statement " pedicello cinereo " is regarded by Fernald as another character to separate *S. adenophylla* and *S. syrticola*, because the latter has a glabrous and straw-colored pedicel. In my opinion, Andersson did not intend to say that the pedicel is pilose but he evidently used the word cinereus only in the sense of " grayish." When Fernald proposed his new species he did not know of the specimens collected by Macoun, Ross and Spreadborough in the James Bay region. They connect the original habitat of (probably southern) Labrador with that of *S. syrticola*. The only difference between the forms of James Bay and those of the Great Lakes, so far as I can judge, is in the length of the styles, which mostly measure about 1.5 mm. in typical *S. adenophylla*, while they rarely are longer than 1 mm. in *S. syrticola*. We need, however, more copious material to decide whether this is a constant character sufficient to separate the form of the Great Lakes as a variety. I have seen the following specimens which undoubtedly represent typical *S. adenophylla*.

KEEWATIN. Gravelly bank of Severn River, July 30, 1885, *J. M. Macoun* (No. 2004, O., fr. adult.) — ONTARIO. Hudson Bay, Cape Henrietta Maria, August 14, 1904, *W. Spreadborough* (No. 62631, O., fr. adult.); The Beacon, mouth of Moose River, July 19, 1904, same coll. (62630, O., fr. adult.). — N. E. TERRITORY. East Main 1892, *A. H. D. Ross* (No. 2438, O., st.; fragment). — LABRADOR, without exact locality, *Dr. Morrison* (fr.; K.; type).— QUEBEC: Saguenay District: Natashquan River, July 24, to August 10, 1912, *C. W. Townsend* (fr.; G.). Lake St. John District: Roberval, shore of Lake St. John, August 22, 1895, *J. G. Jack* (st.; A.).

Of the western form (*S. syrticola* Fern.) I have seen specimens from western Ontario (Cockburne Isl., Prince Edward District), Wisconsin (Manitowoc County), Michigan (Allegan, Huron, Berrien, Lake, and Porter Counties), Illinois (Cook County), Ohio (Erie County), Pennsylvania (Erie County).

6. **S. commutata** Bebb in Bot. Gaz. XIII. 110 (1888). — ? *S. livida* a. *rostrata* α. *lanata* Dippel, Handb. Laubh. II. 256 (1892). — Coville in Proc. Wash. Acad. Sci. III. 317, t. 37 (1901). — Piper in Contrib. U.S. Nat. Herb. XI. 216 (Fl. Wash.) (1906). — Ball apud Piper & Beattie, Fl. N.W. Coast, 116 (1915). — Henry, Fl. S. Brit. Col. 100 (1915), excl. synon. — Rydberg, Fl. Rocky Mts. 194 (1917). — *S. Barclayi* Jones, Will. Fam. 16 (1908), pro parte, non Andersson. — In 1901, Coville explained the history of this species. It was described by Bebb from specimens collected by Cusick on the Eagle Creek Mountains, near Snake River in Oregon, which I have seen in the herbarium of the Field Museum. As type must be taken Cusick's No. 826 (sheet 7751 of Herb. Bebb. in C.).[1] Bebb, then, distinguished *S. commutata* from his *S. conjuncta* (see above on p. 151), but he did not compare both sufficiently with *S. Barclayi*. Coville was the first to separate correctly this and *S. commutata*.

I have seen specimens of the typical form from Oregon (Umatilla, Wallowa, Union, Klamath and Grant Counties), Washington (Pierce, Mason, King, Chelan, and Okanegan Counties), Montana (Glacier Nat. Park and Teton County), British Columbia (Kootenay, Yale, New Westminster, and Cassiar Districts), Alberta (Rocky Mountain District) and Alaska (from White Pass and Lake Atlin to Prince William Sound and Kukak Bay). There are also some specimens of J. N. Rose's (No. 170 and 404, fr. C.) from the Yellowstone Park which may belong to this species, which probably also occurs in northern Nevada (Pine Forest Lake, Griffith & Morris, No. 226, Herb. Brooklyn Bot. Gard.), and in northern California (Modoc County, Warner Mts., Austin & Bruce, No. 33, m., Cal., filamentis glabris, see later under *S. Eastwoodiae*).

Bebb made 3 varieties. First *S. commutata* var. *sericea*, of which the type came from Mt. Hood in Oregon where it was collected by Howell and also by Henderson. This is a form with a very dense white tomentose pubescence of the leaves, and apparently connected with the type by many intermediate forms. Its synonym is as follows: *S. commutata* var. *sericea* Bebb in Bot. Gaz. XIII. 111 (1888). — *S. glauca* var. *villosa* Howell. Fl. N.W. Am. 621 (1902), pro parte, non Andersson. — *S. commutata* var. *mixta* Piper in Contr. U.S. Nat. Herb. XI. 216 (Fl. Wash.) (1916). I refer to it the following specimens.

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[1] On this sheet there is the following extract of a letter of the collector which seems worth quoting: "826. This I saw in great abundance in the high Mts. It is commonly 3°–4°, but in sheltered localities is rarely 8′ or 10′ in length and is often but a few inches. Many spec. were seen that I could not decide whether they were of this or the preceding (*S. Barclayi*). I have enclosed such under 1304 b–c, and e. Nothing but fruit could be had and often not that, and perhaps the matter cannot be definitely settled till good spec. of all can be had. 826 must be a local form. When sent to Watson some years ago he said "I cannot match it, and unless you have it from Howell or Suksdorf we may say that it does not extend farther west than our Blue Mountains. In them it seems to be limited to a small district. East of them is a range (near Snake River) known as Eagle Creek (on the South) or Wallowa Mts. (on the n.) very high and rugged, a part of the Idaho system rather than the Blue Mts. In these I find it in great abundance, as no doubt it is on the other side of the Snake River. If it extended to the Rocky Mts. some one would certainly have found it ere this."

WASHINGTON. Mason County: Olympic Mts., August 11, 1890, *C. V. Piper* (m., f., Pu.); same loc., July 19, 1897, *J. B. Flett* (No. 112, m.; Pu.). Chelan County: Skagit Pass, Horseshoe Basin, August 24, 1892, *Lake & Hull* (No. 765, m,. f.; Pu.). Pierce County: Mt. Rainier, 2000 m., August, 1889, *E .C. Smith & C. V. Piper* (m., fr.; M.; forma quasi ad var. typicam transiens).

OREGON. Hood River County: moraines near the snow line on the north side of Mt. Hood, July 29, 1886, *Th. Howell* (m., f., fr.; C., N.; type; stylis apice bifidis, stigmatibus parvis, pedicellis ad 1.5 mm. longis interdum pilosis bracteam subsuperantibus); August 1, 1886, same coll., (m., f., fr.; G.; stylis integris, pedicellis plus minusve aequilongis glabris, glandulam ad 3-plo superantibus); near or on the glaciers, July, 1884, *L. F. Henderson* (m., fr.; G.); south west slope of Mt. Hood, at timber line. 200–2300 m., 1896, *C. N. Merriam* (m.; W.).

Bebb's second variety is var. *denudata* which came from the same locality as the typical *S. commutata*. This is a very uncertain form, Bebb's description being very insufficient: " Young leaves smooth or nearly so, more or less distinctly serrulate." Cusick collected it on the Eagle Creek Meadows in Oregon but, unfortunately, there is no type sheet preserved in Bebb's herbarium. Ball, who looked over the *commutata* material in herb. Bebb in 1908 marked sheet 7750 (Cusick's No. 1304 c) as " type materia of var. *denudata* Bebb." Bebb has drawn a figure of a fruit on this sheet and written in pencil: " Capsule glabrous ped. pilose short scarcely exceeding the gland, leaves elliptical or ovate-lanceolate tomentose both sides," which is quite correct, but it does not agree with the original diagnosis given above. There are some more sheets of Cusick's collection. Of these the sheet with the Nos. 7741–42 may be regarded as the type material. It consists of 2 branchlets with rather old female flowers and two with male flowers which are marked No. 968 (in pencil by a hand unknown to me) and two sterile branchlets which are numbered 981 (this is No. 7741, C.). I should refer the flowering specimens to *S. Barclayi* (like Cusick's No. 2302 of 1899, Higher Wallow Mts., of which the young leaves are more or less bluish gray beneath; this number is named var. *denudata* in Herb. C.), but the leaves remain underneath rather pale green if the leaves of some elder branchlets (No. 981) represent the same form. The ovaries are partly rather copiously pubescent, but partly glabrous, as it is not unfrequently the case in *S. Barclayi*. The dark color of the bracts, too, points to *S. Barclayi*, but much better material is needed to decide the question whether this is a good variety of *S. Barclayi* or *S. commutata*. Bebb's note in pencil on sheet 7741–42 runs as follows: " Capsule glabrous (abnormally slightly hairy), style short, stigmas mostly entire, scale dark, thinly villous, leaves ovate-lanceolate glabrous, green both sides, the earliest finely glandular serrulate, mature leaves less conspicuously so, stipules ovate, pointed glandular-serrulate, buds large smooth." I regard this sheet as Bebb's type. Ball's type (sheet 7750) I am unable to distinguish from typical *commutata*, likewise sheet 7745 which Ball also refers to var. *denudata* though the branchlets partly look more like those of var. *sericea*. On the other hand sheet 998 (which bears No. 1304 of Cusick) can be taken for var. *denudata*, as also the material on the sheets 999 and 1000, which represent Cusick's No. 1304. After all I am not well enough acquainted with the variability of *S. commutata* to make a decisive statement as to the taxonomic value of var. *denudata* and its true relationship. Provisionally, I refer to it the following forms which certainly need a thorough investigation in the field.

OREGON. Baker County: Eagle Creek Meadows, August, 1886, *W. C. Cusick* (No. 1304 m., st.; sheets 999–1000 in C.; 1304^{a}, f., ex parte; sheet 998 in C.; without number, f., sheet 7742, 7741, st. in C.; which I regard as the type as already explained); Eagle Creek Mts., about 2300 m., alt., August and September, 1881, same coll. (No. 968, f., at least partly; sheet 205445 in C.; this form resembles much Cusick's No. 2302 but in No. 968 the leaves are green beneath: named by Ball var. *denudata*, in the specimen in Herb. G. the fruits are pubescent); highest Powder River Mts., 1897, same coll. (No. 1810^{a}, fr.; Cor.; foliis anguste lanceolatis). — Union County: Wallowa Mts., Bear Creek Watershed, meadow in Basin Creek, 2050 m., September 8, 1907, *F. V. Coville* (No. 2481, f., fr.; W.; "the specimens had recently emerged from a snowbank"; the pedicels are pilose). Harney County: Highest Stein Mts., wet sides near top, July 5, 1898, *W. C. Cusick* (No. 2009, m., f.; Cor., Pu.; stomata in pag. sup. foliorum numerosa, pedicelli pilosi).

WASHINGTON. Pierce County: Mt. Rainier, about 2100 m., August 12, 1884, *Piper & Smith* (No. 701, fr., C. [sheet no. 5205]; Nos. 702 seem to be typical *S. Barclayi*); same Mt. August 1890, *E. C. Smith* (f., sheet 6582 in C.; rather typical *commutata* or a transitional form). County unknown: Cascade Mts., Lake south of three Sisters, meadow at head of lake, August 7, 1897, *Coville & Applegate* (No. 551, st.; W.; forma satis incerta).

Bebb's third variety is *S. commutata* var. *puberula*, in Bot. Gaz. XIII. 111 (1888) of which he says: "Capsule thinly puberulous. Transition to *S. californica*." He does not cite a type nor is there a specimen in his herbarium. There are apparently forms of *S. commutata* with more or less pubescent ovaries and fruits, but it is difficult to separate them from *S. Eastwoodiae* unless one has male specimens. So far as I can judge by the rich material I have seen, the filaments of true *S. commutata* are always glabrous while those of *S. Eastwoodiae* are more or less distinctly pilose, at least at the very base. There are, however, forms from those regions where the two species seem to meet which at present I am unable to refer to one species or the other. See also under *S. Eastwoodiae*. It may be possible that Bebb had before him a form of the latter species, but I am inclined to refer to var. *puberula* the following, at least provisionally.

IDAHO. Region of the Cœur d'Alene Mts., Divide between St. Joe and Clearwater River, July 11, 1895, *J. B. Leiberg* (No. 1246, f.; G., N., W.; ovariis sparse pilosis).

OREGON. Grant County: Strawberry Mts., streambank, 2600 m., July 29, 1910, *C. W. Cusick* (No. 3580, f., fr.; G., M.; forma amentis ad 8 cm. longis, pedunculo ad 2 cm. longo excluso, fructibus laxe villosis; bogs, 2660 m., same date and coll. (No. 3585, m.; C.; G., M., N.; filamentis pl. m. coalitis glabris. Union County: without exact locality (see letter quoted on p. 160), same coll. (No. 1304 b, same as No. 997, fr. im.; C.; referred by Ball to *S. californica*); Wallowa Mts.; August, 1896, *C. V. Piper* (No. 2532, fr.; Cor., Pu.). Klamath County: camp at Crater Lake 2050 m., *Coville & Leiberg* (No. 396, f., m., W.; filamentis glabris); near Crater Lake, August 2, 1897, *F. V. Coville & Applegate* (No. 356, f.; W.); Crater Lake Nat. Park, spring below Pole Bridge, August 15, 1902, *F. V. Coville* (No. 1297, fr.; W.; this and the preceding form may belong to *S. Eastwoodiae*, but the male specimen ought to be seen). Josephine County: without exact location, July 9, 1887, *Th. Howell* (No. 16, m.; fr.; C.).

WASHINGTON. Pierce County: Mt. Rainier, August, 1890, *E. C. Smith* (f.; this is sheet 6583 in C. of Herb. Bebb, and agrees well with Bebb's description).

7. **S. Eastwoodiae** Cockerell apud Heller, Cat. N. Am. Pl. ed. 2, 89 (1910), sphalmate *Fastwoodiae*, corrected in Torreya, XI. 264 (1911). — *S. californica* Bebb in Watson, Bot. Calif. II. 89 (1879), non Lesquereux in Mem. Mus. Comp. Zoöl. VI. 10, t. l. fig. 18–21 (Rep. Foss. Pl.) (1878); in Bot. Gaz. XIII. 109 (1888); l. c. XVI. 106 (1691). — Jepson, Fl. Cal. 344 (1909).

This species was described by Bebb from specimens collected by different collectors in California: "from Mariopsa Co. northward (Brewer, Belander, Lemmon, Greene, Mrs. Austin)." I have seen all the specimens in herbarium Bebb, of the Field Museum. Brewer's plant (No. 7192 in C.; No. 2788 of Brewer, "about Mt. Brewer") is not identical with the type because this is said to have "grayish-tomentose" capsules, the ovaries however of Brewer's plant are glabrous, a fact noted also by Bebb in his remarks in pencil on the sheet ("capsule glabrous, stigmas entire, pedicel short scarcely exceeding the glands, leaves of the peduncle glandular-serrulate, stipules more so"). On the other hand, Brewer's No. 2162, near Donner Pass, August 27, 1875. (No. 7191 in C.) is typical sterile *S. Eastwoodiae*. The same sheet bears Bolander's No. 6336, Mono Trail, about 3300 m., August 23, 1886, No. 7381 in C. It is a form more like f. *callicoma* (see later) than the type.

Lemmon's specimens which are named by Bebb himself *S. californica*, which is not the case in the specimens of Brewer and Bolander, consist of 5 sheets; one, No. 7783 in C., bears a reprint of Bebb's diagnosis, and it agrees in every respect with it, so that I take this sheet for the type. With it are identical sheets, Nos. 7782 (fr.), 7781 (m., fr. juv.), 3689 (m.) and 3700 (fr.); No. 3699, however, is much more like *S. orestera*, Greene's No. 457, Sierra Nevada, 3000 m. by a streamlet near perpetual snow, October 14, 1874, named by Bebb *S. californica* (sheet No. 4350 in C.) is typical, but the leaves are similar to those of *S. orestera*.

As to the name, I think it best to adopt Cockerell's new name. According to the International Rules there may be a doubt whether a name has to be changed on account of an older one used for a paleontological species. Sooner or later, however, we shall need a list also of these names, and then we certainly shall avoid their use.

S. Eastwoodiae seems to be very closely related to *S. commutata* and the main characters to distinguish these two species are the pubescence of the filaments, the normally hairy ovaries, and the closer more distinct glandular serration of at least the lowermost and middle leaves; besides this *S. East-*

woodiae seems to have distinctly darker bracts. The serration sometimes suggests that of *S. adenophylla*.

I have seen what I call typical *S. Eastwoodiae* from the following counties in California (north to south): Lasson, Plumas, Sierra Nevada, Placer, Eldorado, Tuolumne, Mariposa, Mono, Fresno and Tulare. This Willow inhabits the Sierra Nevada between about 2300 and 3500 m. alt. It is also known to me from Washoe County, Nevada, and there are forms from the Siskiyou Mts. in Jackson County, southern Oregon, which may belong to this species. Unfortunately I have not yet seen male specimens. Specimens from eastern Oregon, Wallowa Mts., which have been referred to it, are more closely related to *S. commutata* (see var. *puberula*, above).

There is a form which corresponds to var. *sericea* of that species. I wish to propose for it the name **S. Eastwoodiae f. callicoma,** nov. forma: a typo non nisi differre videtur foliis (saltem junioribus) utrinque et ramulis densissime sericeo-lanuginosis. For the type may be taken a specimen collected by G. B. Grant, Tulare County, Sequoia Nat. Park, Marble Fork of the Kaweah River, about 2500 m., July 15, 1902 (f., fr.; St. [sheet 83180]). I have seen quite a number of forms which connect this very hairy form with the typical form. It occurs also in Nevada, Ormsby County, about Marlette Lake, 2460 m., July 10, 1902, *C. F. Baker* (No. 1299, fr., m.; G., M., W.).

In *S. commutata* and in *S. Barclayi* I have observed besides the typical form with glabrous ovaries one with more or less hairy pistils. In *S. Eastwoodiae* the type has pubescent ovaries and fruits but there is also a form with more or less glabrescent ovaries and almost or wholly glabrous fruits. I have already mentioned Brewer's No. 2788 with glabrous capsules. There are more specimens like this, but all need further observation. In a later article I shall describe a new species which looks somewhat like a variety of *S. Eastwoodiae* with glabrous ovaries but, in my opinion, belongs to a different section.

8. **S. orestera,**[1] spec. nov. — *S. glauca villosa* Bebb apud Coville in Contrib. U.S. Nat. Herb. IV. 198 (1893), non Andersson. — Eastwood, Fl. S. Fork of Kings River, 18 (1902). — Jepson, Fl. Cal. I. 343 (1909). — Hall, Yosemite Fl. 68 (1912). — Frutex erectus fide cl. Jepson et Hall, 0.6 ad 3.5 m. altus; ramuli novelli plus minusve dense et adpresse sericeo-villosuli, hornotini laxe villosuli vel fere glabri, flavo-brunnescentes vel plus minusve ut annotini glabri, atrofuscescentes vel purpureo-brunnescentes, vetustiores interdum levissime pruinosi (Brewer, No. 2116), lenticellis sparsis satis magnis flavis praediti, demum epidermide flavescenti solubili obtecti; gemmae oblongae, obtusiusculae, lateraliter plus minusve carinatae, adpressae vel leviter divaricatae, ut ramuli coloratae, pilosae glabraeve, maximae visae 9 m. longae; folia adulta satis firma, chartacea, anguste lanceolata, oblanceolata, lanceolata vel angust elliptico-lanceolata, basi acuta velobtusa, minora apice saepe obtusa, cetera pleraque acuta, interdum subacuminata, minora inferiora pedunculorumque 1:0.4 ad 3:0.8–1 cm., majora superiora 4:0.8–1.1

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[1] Derived from ὀρέστερος, dwelling in the mountains.

ad 6.5:1(–1.5 vel 7.5:2 vel 7:2.4) cm. magna, vel in ramulis vegetis plus minusve obovato-oblonga ad 9:1.8–2.3 cm. magna, majora margine integerrima vel rarius distanter sparse glanduloso-dentato-serrata, minora fere semper (sed saepe satis obscure) glanduloso-denticulata; superne novella dense adpresse subargenteo-sericea vel sericeo-villosula (interdum ut videtur pilis ferrugineis paucis immixtis) pleraque cito plus minusve glabrescentia, sed semper pilis tenuibus adpressis difficile recognoscendis obtecta vel plus minusve villosula, cano-viridescentia, vel dilute viridia, costa flavescente nervisque lateralibus planis vel paullo prominulis, epidermide stomatibus numerosis instructa, cuticula cellularum saepe striata; subtus ut superne sericea, demum paullo pallidiora vel pleraque leviter glaucescentia (pruinosa), interdum magis glabrescentia, costa plus minusve elevata, nervis lateralibus utrinque 4–10 angulo satis acute a costa abeuntibus et versus apicem currentibus, haud vel tenuissme reticulata; petioli 2–5 (–8), raro ad fere 10 mm. longi, superne sulcati, ut costa pilosi; stipulae nullae, minimae vel parvae, lanceolatae, acuminatae, plus minusve glanduloso-denticulatae, ut folia pilosae, petiolis 2–3-plo breviores vel in surculis aequilongae; amenta coetanea, cylindrica, densiflora, pedunculos normaliter foliatos terminantes, rhachi villosa; mascula (1–) 1.5–2.5:1–1.2 cm. magna pedunculo 3–8 mm. longe 3–5-foliato excluso, satis stricta, divaricata; bracteae oblongae ad obovate-oblongae, apice pleraque obtusae ad rotundatae, atrofuscae, utrinque plus minusve sericeo-pilosae pilis summis quam bractea saepissime brevioribus; stamina 2, filamentis liberis (rare circ. $\frac{1}{3}$ coalitis, ? normaliter), $\frac{1}{4}$ ad $\frac{1}{3}$ (rarius ad $\frac{1}{2}$) pilosis, demum bracteam duplo superantibus, antheris aureis ellipsoidalibus circiter 0.8 mm. longis; glandula una ventralis, satis anguste ovoideo-conica, truncata, bractea circiter duplo brevior; amenta feminea sub anthesi circiter 2:0.8 cm. magna, fructifera 2.5:1.5 ad 5:1(–2), in numero 800 Hansenii ad 8:1.8 cm. magna pedunculo 0.5 ad fere 1.5 cm. longo excluso; bracteae ut in masculis vel interdum sublineari-oblongae, acutiusculae, pedicellum etiam sub fructu $\frac{1}{2}$ ad duplo superantes; ovaria anguste ovoideo- vel ellipsoideo-conica, breviter sericeo-tomentosa vel sericeo-villosula; styli distincti, fere semper integri, rariter apice breviter bifidi, 0.8 ad 12 mm. longi; stigmata satis anguste oblonga, plus minusve bifida, stylo $\frac{1}{2}$ ad 2-plo breviores: pedicelli sub anthesi glandulam vix ad $\frac{1}{3}$ superantes, in fructu vix ad 1.5 mm. longi, ut ovaria pilosi; glandula una ut in masculis, in fructu quam pedicellus interdum duplo brevior; fructus perfecte maturi e basi ovoideo-conica rostrati, pedicello excluso 7–8.5 mm. longi, ut ovaria vel laxius villosiusculi, raro subglabri (Dudley, No. 3178).

Type Locality: Mount Goddard, Fresno County, California.

Specimens Examined: California. Tulare County: region of Mineral Gap, Bullion Flat to Mineral King, trail to Gap, abundant, August 4, 1897, *W. R. Dudley* (No. 956^{a}, f.; St.): north of Farewell Gap, August 4, 1895, same coll. (No. 1129, m.; St.); near Little Kern River, about 3500 m., August 11, 1897, same coll. (No. 2548, fr.; St.; amentis ad 5:1.8 cm. magnis); region of same river, Chagoopah Creek, July 24, 1897, same coll. (No. 2266, fr.; St.); 1½ mile below Gap, north side, August 11, 1897, same coll. (No. 2601, fr., 2601^{a}, m.; St.); Head of Middle Kaweah River,

Marble Canyon, about 200–2300 m., August 14, 1895, same coll. (No. 1297, m., fr.; St.); region of Kaweah River, Horsecamp near Black Peak, July 20, 1897, same coll. (No. 2129, m., f.; St.); region of Kaweah Peaks, near Kaweah Lakes, August 2, 1897, same coll. (No. 2397, m., f.; St.); East Fork of Kaweah River, Alta Peak brook, August 1, 1896, same coll. (No. 1523, m., f.; St.); Grant National Park, Cone Meadow, July, 1900, same coll. (No. 2778, f.; St.; foliis maximis ad 9:2.5 cm. magnis); Bear Creek, July 28, 1900, same coll. (No. 2905, m., fr.; St.); Alta Meadow, July 31, 1900, same coll. (No. 2946, fr.; St.); same meadow, 3300 m., 1902, *G. B. Grant*, (No. 5321, f.; St.; ovariis partim glabrescentibus); Boulder Creek, August 15, 1900, *W. R. Dudley* (No. 3294, f.; St.); Evelyn Lake, 3000 m., July 5, 1902, same coll. (N., f.; St.; pedicelli bracteis plusminusve aequilongi); Sequoia Nat. Park, Alta Meadows, 3300 m., July 17–18, 1902, *G. B. Grant* (Nos. 5002, m., 5008, f., 5012, f., fr.; St.); near Mt. Whitney, Crabtree Meadow, about 3600 m., August 6, 1904, *J. D. Culbertson* (No. 4583, fr.; M., N.; pedicellis fere 3 mm. longis, bracteas paullo superantibus, formo porro observanda); region of Middle Tule River, shores of mountain lake, August 30, 1896, *W. R. Dudley* (No. 956, m., fr.; St.; filamentis ¼ ad ⅓ coalitis); trail Farewell Gap to Mineral King, above upper Soda Spring, July 13, 1902, same coll. (m.; St.; foliis obovato-oblongis ad 7:2.4 cm. magnis); in a lateral canyon, same date and coll. (m.; St.); canyon halfway to Gap, same date and coll. (m.; St.); region of Mineral King, Upper Monarch Lake, 3500–4000 m., August 16, 1896, same coll. (No. 1601, fr. im.; St.; stylis apice bifidis); White Chief Mine, above timber line, August 8, 1904, *H. M. Hall & H. D. Babcock* (No. 5653, m., f.; G., St.); above Monarch Lake, 3500–3700 m., August 9, 1904, same coll. (No. 5693, m., fr.) Mono County: Bloody Canyon, August 13, 1898, *J. W. Congdon* (fr.; G.); same canyon, about 3000 m., July 23, 1907, *R. A. Ware* (f.; G.); Mono Pass, about 2800 m., same date and coll., (m., G.; "shrub 1.2 to 3 m. high"); same pass, about 3500 m., same date and coll. (m., f.; G.; 0.90 m. high); same pass, about 3450 m., July 17, 1911, *W. L. Jepson* (No. 4432, f.; Jeps.); Mt. Dana, August 27, 1895, *J. W. Congdon* (fr.; St.); Dana Fork, near Mt. Dana, in moist bottoms, about 3050 m., July 14, 1909, *W. L. Jepson* (Nos. 3319 m., f., 3320, f.; A.). Fresno County; Mt. Goddard, along lake shore, above timber line, about 3700 m., July 24–26, 1900, *H. M. Hall & H. P. Chandler* (No. 695, f. type and m. syntype; Jeps., N., M., St., W.); same mountain, along south fork of S. Joaquin River, about 3000 m., same date and coll. (No. 664, fr.; St. "bark gray, 0.9–1.2 m. high"); East Lake, July, 1899, *A. Eastwood* (m., f.; G.); Nelly Lake, about 3800 m., July 15, 1917, *A. L. Grant* (No. 1087, fr.; A.); King's River region; Kettle Mt. Ridge, meadow, August 23, 1904, *W. R. Dudley* (fr., st.; St.); Horse Corral Meadow, August 11, 1900, same coll. (No. 3178, St.; fr. fere glabratis); meadows near Black Mt., shores of Red Mt. Lake, about 3150 m., July, 1900, *Hall & Chandler* (No. 733, fr.; St.); Upper King's River, Rowell Meadow, August 23, 1904, *W. R. Dudley* (fr.; St.; forma porro observanda); Nellie Lake, July 15, 1917, *A. L. Grant* (No. 1087, fr.; St.); King's River, Bullfrog Lake, up Paradise Creek, July 9, 1910, *K. D. Jones* (No. 733, m. tantum; Herb. Univ. Cal.). Mariposa County: Cathedral Trail, August 7, 1898, *J. W. Congdon* (m., f.; G., St.; stylis apice breviter bifidis, fructibus pedicello excepto ad 8.5 mm. longis); Chilnualna Trail, August 1, 1898, same coll. (fr. im.; G.; forma mihi quamvis incerta fructibus pedicellis ad 3 mm. longis bracteas superantibus suffultis; an hybrida cum *S. Lemmonii*?); Crescent Lake, August 9, 1890, same coll. (fr., G.); Johnson Lake, August 2, 1898, same coll. (m.; G.; forma porro observanda, filamentis ⅓ coalitis); Bridal Veil Trail, August 4, 1898, same coll. (fr. G.); Mt. Hoffmann, June, 1864, *W. H. Brewer* (No. 1677, fr.; C., W.; low bush); August 14, 1907, *A. Eastwood* (No. 361, f.; C.) Vogelsang Pass, about 3250 m., July 14, 1911, *W. L. Jepson* (No. 4429 L., m., f.; A.); Seavey Pass, 3000 m., July 27, 1911, same coll. (No. 4525, m., f.; Jeps.); Benson Pass, July 24, 1911, same coll. (No. 4504, m., f.; Jeps.); along brooks east of Cathedral Pass, July 21, 1901, *W. R. Dudley* (m.; St.); Troja, August 24, 1907, *A. Eastwood* (No. 615, m.; Cal.); Mono Pass Trail, August

20, 1907, same coll. (No. 518, m., f.; Cal.); shores of Elisabeth Lake, about 3600 m., August 15, 1916, *F. J. Smiley* (No. 790, f.; G.); Tuolumne Meadow, August 19, 1907, *A. Eastwood* (No. 494, fr.; Cal.); same meadow, July 17, 1907, *R. A. Ware* (f.; G.). Tuolumne County: Summit Sonora Pass, 3200 m., August 15, 1915, *A. L. Grant* (No. 304, fr.; G. 321, m., fr.; Jeps.); on Lambert's Dome, crevices of dry ledge, 3600 m., July 20, 1907, same coll. (m.; G.); Soda Spring Canyon, above Kennedy's Lake, 3000 m., September 3, 1915, *A. L. Grant* (No. 470, m., fr.; Jeps.); Fort of Mt. Leavitt, 3500 m., August 29, 1915, same coll. (No. 417, fr.; Jeps.). Alpine County: Highland Lake, about 2800 m., July 24, 1911, *L. R. Abrams* (No. 4751, f.; St.); Tryon Meadows, and north slope of Folger Peak, Stanislaus Forest, 2540–2760 m., July 12, 1913, *W. W. Eggleston* (Nos. 9644, m., 9645, f.; W.); Blue Lakes, about 2300 m., July 25, 1911, *L. R. Abrams* (No. 4755, f.; St.); Carson Spur, about 2800 m., October, 1894, *G. Hansen*, (No. 800, fr.; A., B., M., St.; forma incerta amentis maximis ad 7.5:1.8 cm. magnis). Placer County: Summit, about 2300 m., July 16, 1899, *A. A. Heller* (No. 9842, f.; W.). Sierra County: Salmon Lake, July, 1899, *E. C. Sutcliffe* (fr.; A.). ?Inyo County: Bullfrog Lake to Kearsarge Pass, July 5–15, 1900, *W. L. Jepson* (No. 851, m., f.; Jeps.).

NEVADA. Elko County: East Humboldt Mts., about 3000 m., August, 1868, *S. Watson* (No. 1099, f., fr.; C., N., W.); Rattlesnake Canyon near Lee Post Office, about 3300 m., August 25, 1908, *A. A. Heller* (No. 9566, fr.; A., G., M., Reno, St.); same Mts., ridge in the north side of Lamville Canyon, about 3000 m., August 8, 1908, same coll. (No. 9360 m., f.; W.) canyon at the head of South Fork of Humboldt, about 3250 m., August 11, 1908, same coll. (No. 9410, f.; W.; foliis satis discoloribus).

This species is the *S. glauca villosa* of the Californian botanists, but it is in no way related to Andersson's *S. glauca villosa*, which belongs to sect. *Glaucae* (see my note II. in Bot. Gaz. LXVI. 327), while *S. orestera* seems to be most closely related to *S. Eastwoodiae*. It differs from it by the narrower leaves which are entire with the exception of the lowermost of which the margin is slightly glandular, and by the longer fruits which measure up to 7–8.5 mm. in length (in *S. Eastwoodiae* only 6–6.5 mm.). There may be hybrids between the two species. On the other hand the leaves of *S. orestera* sometimes resemble those of *S. Lemmonii* with which I shall deal later. In this species the leaves are much more glabrous, and distinctly glaucescent beneath, and it has longer pedicels. *Salix orestera* may also have leaves with a rather pruinose under surface, and there are certainly quite a number of forms which need a careful observation in the field. A. L. Grant's No. 1087 with its long pediceled fruits and the rather discolor leaves comes very near *S. Lemmonii* and may be of hybrid origin.

S. orestera inhabits the Sierra Nevada from Sierra to Tulare County and the adjacent parts of Nevada. It is a distinct species to which I wish to direct the special attention of all collectors.

b. SECT. BALSAMIFERAE

When I proposed this new section in my Ill. Hand. Laubholzk. I. 57 (1904), I did not know much of the American Willows but I had the impression that *S. balsamifera* Barratt represented a distinct type. After having been able to study almost all the species hitherto known I still believe that this species cannot be united with the other *Cordatae* from which it well differs by the short thick and blunt gland of its flowers, the light bracts, and the reticulation of the undersurface of the leaves which have a balsamic odor when expanding. I am not aware whether there is a species in northern Asia which can be regarded as closely related to the Balsam Willow, but the strange *S. obtusata* which I deal with below may have the closest affinity with it of all the American species.

S. pyrifolia Andersson in Svensk. Vetensk. Handl. VI. 162, t. 8, fig. 93 (Monog. Salic.) (1867), excl. var. *obscura*. — Britton & Brown, Ill. Fl. ed. 2, I. 596, fig. 1461 (1913). — Fernald in Rhodora XVI. 116 (1914). — *S. cordata* Richardson in Franklin, Narr. Jour. Polar Sea, Bot. App. VII. 752 (1833), non Muhlenberg. — *S. cordata β. balsamifera* Hooker, Fl. Bor.-Am. II. 149 (1839). — *S. balsamifera* Barratt apud Hooker, l. c., pro synon. — Bebb in Bot. Gaz. IV. 190 (1879); in Bull. Torr. Bot. Club, XV. 121, t. 81, figs. 1–5 (White Mt. Will. I) (1888); apud Watson & Coulter, Gray Man. ed. 6, 485 (1890). — Jack in Gard. & Forest, I. 246 (1888). — Britton & Brown, Ill. Fl. I. 504, fig. 1201 (1896). — Sargent, Silva, XIV. 63, t. 728 (1902). — Schneider, Ill. Handb. Laubh. I. 57, fig. 23 k, 20 a-b (1904). — Britton, Man. 314 (1901); ed. 2, 314 (1905). — Robinson & Fernald, Gray Man. 324, fig. 653 (1909). — Fernald in Rhodora XIV. 69 (1912). — *S. pyrifolia α. laeta* Andersson in De Candolle, Prodr. XVI.^{2} 254 (1868). — *S. Columbiae* Nelson in Bot. Gaz. LVI. 473 (1913).

This excellent species has been first described by Hooker as var. *β balsamifera* of *S. cordata*. In using Barratt's name *balsamifera* Hooker expressly stated: " It is only fair to observe, that Dr. Barratt is disposed to consider the *β* and *γ* [which is *S. Mackenzieana*] good species." Andersson (in Öfv. Svensk. Vetensk. Akad. Förh. XV. 125 [1858]), under *S. cordata* mentions Barratt's species in the following way: "Sub hac specie duas formas attulit Hooker, l. c. 1. *S. balsamiferam* Barratt, et 2. *S. Mackenzianam* Barratt. Quantum e speciminibus in herb. Hookeriano judicare possum *S. balsamifera*, cujus ramus foliis tectus tantum adest, ad *S. acutifoliam* W. pertinet. Ramus cortice coerulescente-castaneo obductus, stipulae lanceolatae, curvatae, gemmae magnae acutae, folia fere 4-pollicaria, semiunciam lata, argute sed remotiuscule serrata, subtus glaucescentia." Andersson, as Bebb already explained, probably took his notes from a piece of Drummond's collected in 1825 at Cumberland House. It is preserved in Herb. H. B. & T. (N.) as No. 35 (Bebb quotes No. 55), and it is named by Barratt *S. balsamifera angustifolia*. I agree with Bebb that this piece belongs to *S. petiolaris*. In 1867 and 1868 Andersson cites *S. balsamifera* Barratt as a synonym under *S. discolor* Muhl. To this species does indeed belong No. 54 Herb. H. B. & T. which Barrett named *S. balsamifera intermedia*. His type is No. 53 of the same collection, and we find it under the name *S. cordata β* Hooker in the Kew Herbarium (from which I saw a sketch of Oliver's in the Gray Herbarium) and also in the herbarium of the New York Botanic Garden. Here it consists of 3 (not 2 as Bebb says) pieces. One was collected by Richardson at Lake Winnipeg, and this is to be taken for the type. It is but a fruiting ament with its peduncle which bears two leaflets. The second was found by Drummond " between N.Y. and Cumberland House." It has male aments, and it is not mentioned by Bebb. The third is a sterile branchlet collected in 1825 by Drummond at Cumberland House. This piece apparently is identical with the specimen at Kew where the sheet bears still another fragment with a fruiting ament. By a hand unknown to me it is marked " *cordata* Muhl. fide Ands. 1857."

In 1867, Andersson described his *S. pyrifolia* from specimens collected " in America boreali ad lacum Winipeg (in paludibus prope Brochet) et in regione fl. Saskatchavan (Bourgeau)." Neither in 1867 nor in 1868 does Andersson make mention of the piece of Drummond which he in 1858 named *S. cordata*. In the Gray Herbarium there is a male piece of Bourgeau from " Winipeg Valley " which Andersson himself marked "*S. pyrolaefolia* Ledeb." He apparently made this determination before he decided to describe a new species because in 1867 he states that *S. pyrifolia* is " sine dubio *S. pyrolifoliae* asiaticae in America analoga."

The name *pyrifolia* has already been used by Schleicher (Cat. Pl. Helv. ed. 3, 26 [1815]) but this is a nomen nudum, and according to the international rules Andersson's name can stand. Nelson's name *S. columbiae* has to be adopted by those who follow the Philadelphia Code, but this is a very unsuitable name because the species is wanting or at least extremely rare in British Columbia and not known from the region of the Columbia River at all. Nelson probably has been misled by Ball's use of the name *S. pyrifolia* (apud Coulter & Nelson, New Man. Rocky Mts. Bot. 133 [1909]) for a species of sect. *Cordatae* for which he has since proposed a new name which unfortunately has not yet been published. As Fernald already explained (in Rhodora XVI. 116 [1914]) "the highly appropriate and long used name, *S. balsamifera* Barratt, was published as a specific name merely in synonymy and was not validated as a specific name until 1879, when Bebb brought it forward (Bot. Gaz. IV. 190). In the mean time *S. pyrifolia* Andersson was properly published . . . in 1867 and as the first valid specific name must stand."

Andersson . . in 1867, also proposed a *S. pyrifolia* **obscura* citing as type " in Rocky Mountains (Bourgeau)." This name is mentioned by Ball, apud Coulter & Nelson, l. c. 133 (1909) with the synonym *S. rotundifolia* Nutt. Later, as stated above, Ball gave to his *pyrifolia* a new name, and he at present regards Andersson's var. *obscura* as a form of his new species. In my opinion Andersson's form is really an obscure one, which cannot be properly interpreted without seeing the type specimen. In 1868, Andersson gives the type locality as "vallée des Arcs (August, 1858: Bourgeau) " and says: " — forma *β. obscura* est *pyrolaefolia* adhuc similior, sed capsulis longius pedicellatis, obtusiusculis, stylo multo productiori et foliis subovalibus differt. potius cum *S. cordata* comparanda; folia autem subtus viridula, i.e. concoloria, breviora et latiora, et amenta affinitatem cum vera *pyrifolia* demonstrant." I cannot find a mention of a locality " vallée des Arcs " in Palliser's Papers Explor. Brit. N. Am. (1859) where Bourgeau's route is not distinctly indicated, but this variety *obscura* certainly does not seem to belong to *S. pyrifolia* sensu stricto which is the same as Andersson's var. *laeta* in 1868.

Bebb, who in 1879 dealt with *S. balsamifera* and took up this name, discussed it again in 1888 when he proposed besides a var. *typica* three more varieties. Of these var. *vegeta*, too, coincides with the type while according to Fernald (in Rhodora XVI. 116 [1914]) var. *lanceolata* can be retained as *S. pyrifolia* var. *lanceolata* Fernald because it " is found in some of the swamps of eastern New Foundland to be so uniform and to occur in such extensive areas that it seems well worth recognition." There is no type in Bebb's herbarium in the Field Museum, and his figure (t. 81, fig. 7) shows a leaf as it is often found in the typical form. Bebb's var. *alpestris* seems to be nothing but a lower small leaved form of which the leaves are only partly green on both sides, as is shown by the type which was collected by E. Faxon on Mt. Lafayette, White Mts., Eagle Lake, 1400 m., July 20, 1885 (sheet No. 276971 in C.).

As to the relationship of *S. pyrifolia* Bebb, in closing his remarks on *S. balsamifera* (in 1888) says: " A well defined species, not shading off into any other, not even into its nearest congener, *S. cordata*, from which it is always distinguished by the peculiar texture and veining of the leaves, absence of stipules and very loosely flowered fertile aments." As I have already said, I believe that the most distinct character by which *S. pyrisolia* may be separated from the *Cordatae* is the short thick and blunt gland. All the species of sect. *Cordatae* known to me have narrow elongated glands which look very different. Only one species, *S. myrtillifolia*, has similar glands, but as is the case with the other *Cordatae* its bracts are fuscous (at least at the tip), and it does not have the distinct nervation or reticulation of the mature leaves so conspicuous in *S. pyrifolia*, which besides has the remarkable balsamic odor of the unfolding leaves which it does not lose even in the herbarium.

Salix pyrifolia is principally found in the region from Newfoundland and southern Labrador westward to the Winnipeg region; it also occurs (but apparently sporadically) in Saskatchewan, British Columbia and the southwestern part of the Northwest Territories. The exact limits of its known distribution may be given as follows: Northwest Territories (between Lake Athabasca and Chesterfield Inlet, *J. W. Tyull*, No. 1715; Hill Island Lake, halfway between Lake Athabasca and Great Slave Lake, *F. Harper*, No. 99021, O.), Saskatchewan (specimens of Drummond's and Bourgeau's mentioned above), Manitoba (Lake Winnipeg region, *Richardson & Bourgeau;* Berens River, *J. M. Macoun*, No. 24252, O.), Ontario (Kenora, Thunder Bay, and Carleton Districts), Quebec (Abitibi, Terrebonne, Chateaugay, Chambly, Stanstead, Champlain, Portneuf, Temiscouata, Rimouski Districts, Magdalen Islands), Labrador (Sandwich Bay Château, Caribou Isl.), Newfoundland (from the eastern drainage area of the Humber River system to the Avalon Peninsula), New Brunswick (Northumberland, Kent, Westmoreland, Sunbury and St. John Counties), Nova Scotia (Pictou County), Prince Edward Island, Maine (Aroostook, Pisquataquis, Hancock Counties), New Hampshire (White Mountains), Vermont (Lamoille, Orleans Counties), New York (Essex County), Michigan (St. Clair, Genesee, Chippewa, Houghton, Keweenaw Counties), Minnesota (Millelacs, Aitkin Counties). From British Columbia I have only seen two specimens, one collected by J. Macoun under 54, Telegraph Trail, June 18, 1875 (No. 1666, f.; G.) and the other by J. M. Macoun, Nacho (? Nazko) River, in swamps, June 18, 1875 (No. 24254, f.; O.). Both specimens need further study, but possibly *S. pyrifolia* will be found in more places between Lake Winnipeg, the Great Slave Lake and northern British Columbia.

I refer to sect. *Balsamiferae* not without a good deal of doubt, also the following species which on the other hand shows some relationship to the Commutatae.

S. obtusata Fernald in Rhodora IX. 223 (1907). — This remarkable species is so far only known from the Gaspé Peninsula. The type has been collected by Fernald & Collins on innundated gravelly bars and beaches, River St. Anne des Monts, near the head of the Grand Rapids, July 15, 1906 (No. 203, fr.) and August 16, 1906 (No. 203^a, st.), and by Williams and Fernald in Bonaventure County, New Carlisle, Arborvitae swamp, July 28, 1902 (st.; Cor.; 0.9 to 1.2 m. high). The last specimen apparently belongs to this species, but it has no stipules which are rather large and persistent in the type.

According to Fernald "the leaves are glabrous, or the youngest arachnoid-tomentose," but I have been unable to find a trace of an arachnoid pubescence on them. The following description seems to me more correct: folia novella superne paullo (praesertim ad costam) puberula, demum costa basi pilosula excepta glabra, subtus ab initio glaberrima. Fernald says: " Closely allied to and strongly simulating the Siberian *S. pyrolaefolia* Ledeb., but differing in its more shallowly toothed leaves, shorter sessile aments and very short styles." I am by no means convinced, however, that the Siberian species is closely related to *S. obtusata* of which much more copious material is needed to decide the question of its true relationship.

VIENNA, *November*, 1919

THE LIUKIU ISLANDS AND THEIR LIGNEOUS VEGETATION

E. H. WILSON

THE Liukiu Archipelago is a group of small islands between Lat. 28°, 30′ and 24°. N. which like a string of stepping stones connect south Japan with Formosa. It is divisible into three lesser groups, a northern, the Oshima group, a central, the Okinawa group, and a southern, the Sakishima group. All the islands are washed by the warm Japan current and enjoy an equi-